



## *Aethodelphax prairianus* gen. et sp. nov. (Hemiptera: Delphacidae) and seven congeneric species from North American *Delphacodes*

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### Abstract

The new genus *Aethodelphax* gen. nov. is described to include one new species, *Aethodelphax prairianus* sp. nov. and 7 species transferred from *Delphacodes*: *Aethodelphax aetocephalus* (Beamer, 1948), **comb. nov.**, *A. alatus* (Beamer, 1948), **comb. nov.**, *A. caninus* (Beamer, 1947), **comb. nov.**, *A. concavus* (Beamer, 1948), **comb. nov.**, *A. megadontus* (Beamer, 1951), **comb. nov.**, *A. paraparvulus* (Beamer, 1948), **comb. nov.**, and *A. sagittatus* (Beamer, 1947), **comb. nov.** A diagnosis for all species, illustrations and an identification key is provided. All species are found in the midwestern and southeastern states of the U.S., except *A. caninus* which is recorded from Arizona and New Mexico, and are all associated with native grasslands.

**Key words:** Delphacidae, Fulgoroidea, *Delphacodes*, new genus, new species

### Introduction

This study reports a new and locally common species of Delphacidae that appears to be restricted to bluestem grasses, *Andropogon* spp., in native tallgrass prairies. It is superficially similar to the widespread bluestem specialist *Muirodelphax parvula* (Ball) (see Hamilton & Kwon 2010) and has probably been overlooked until now in grassland surveys. Its distinctive antennal and genital characters support creation of a new genus for its reception. Seven other related, but much rarer species, previously described as “*Delphacodes*” (Beamer 1947; 1948a,b; 1951), are here transferred to this new genus.

*Delphacodes* Fieber (Delphacini) has been variously defined to include many Nearctic species (Metcalf 1943; Beamer 1947, 1948a,b, 1951). Presently, it is considered to be a western Palearctic genus of 10 species (Wagner 1963; Asche 1985; Holzinger *et al.* 2003). The type specimen of the type species of *Delphacodes*, *D. mulsanti* Fieber, is a female in poor condition (China 1954). The crudely illustrated male genitalia (Fieber 1866, fig. 32) has led to a number of attempts to interpret the features of the species and the limits to the genus (e.g., China 1954; Linnavuori 1957; Dlabola 1957, 1961; Nast 1958; Le Quesne 1960a,b, 1964; Wagner 1963) culminating in Asche & Remane's (1983) review of the genus.

In the New World, 115 species are currently assigned to *Delphacodes*. While it has been established that the New World “*Delphacodes*” is polyphyletic (Urban *et al.* 2010), and accommodates numerous autapomorphic species (Hamilton 2002), it has not been definitively established whether any of the New World species are *Delphacodes sensu stricto*. Ongoing study of the features of Nearctic *Delphacodes* fauna suggests that closely related species differ considerably in proportions (crown, face, rostrum, antennal segments, leg segments, genital processes) and can be grouped into genera based on less variable characters of antennae and color pattern (Bartlett & Deitz 2000; Hamilton 2006; Hamilton & Kwon 2010), or through synapomorphies of the tarsi and male genitalia (e.g., Bartlett 2007; Gonzon & Bartlett 2007). Recent phylogenetic results (Urban *et al.* 2010) have confirmed some expected clades among New World *Delphacodes* and question other proposed groupings based on minor genital and rostral characters such as *Paraliburnia* Jensen-Haarup, 1917, *sensu* Hamilton (2002).

The new genus described herein is within the advanced Delphacini (*sensu* Urban *et al.* 2010) and is most similar to the genera *Muirodelphax* Wagner (*sensu* Hamilton & Kwon 2010) and *Elachodelphax* Vilbaste (*sensu* Hamilton 2002) in antennal and genital characters but have a narrower crown and are differently colored. The eight included species are illustrated, with a key and comparative diagnosis provided.

## Material and methods

The morphological terminology follows Asche (1985), but for descriptive purposes the parameres will be referred to as having a proximal “basal angle”, and distal “inner”, and “outer angles” (*sensu* Metcalf 1949). The heading ‘genitalia’ should be understood to refer to males and include the terminal segments. “GL” numbers refer to Grassland Leafhopper Survey records maintained by H.H. Ross (1948–1968); copies of these field notes are in INHS and CNCI. The collections from which specimens were examined are abbreviated as follows (collection abbreviations according to Arnett *et al.* 1993):

AMNH	American Museum of Natural History, New York, NY, USA.
CNCI	Canadian National Collection (CNC) of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada.
INHS	Illinois Natural History Survey Insect Collection, University of Illinois, Champaign, IL, USA.
NCSU	North Carolina State University, Department of Entomology, Raleigh, NC, USA.
SEMC	University of Kansas, Snow Entomological Museum, Lawrence, KS, USA.
UDCC	University of Delaware, Department of Entomology and Wildlife Ecology, Insect Reference Collection, Newark, DE, USA.
USNM	U.S. National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.

*Aethodelphax* **gen. nov.** is contrasted with *Delphacodes* s.s. based on illustrations and descriptions from Asche & Remane (1983) and Holzinger *et al.* (2003) and available specimens: 2 *D. mulsanti* (1 male, 1 female, from southern France [“Canet”]), 3 *D. capnodes* (1 male, 2 females, Germany [“Halle”, “Holstein”, and “Westfalen”], all Det. Wagner from NCSU collection), and 2 *D. audrasi* (1 male, 1 female, Krasnodarskiy Kray, Region of Krasnodar, Russian Federation, Det. Emeljanov, UDCC collection).

Diagnostic descriptions are provided for all species included in *Aethodelphax*. For previously described species, the purpose of these descriptions is to provide uniform diagnostic features for each species, rather than to redefine the species. Measurements reported are averages (in millimeters, with “n” indicated) with standard deviation as appropriate. Total body length was measured in dorsal view from apex of frons tip to abdominal segment 10 (i.e., excluding the ‘anal style’); body width was measured at the tegulae.

All observed specimens are reported, although tentatively identified female specimens may be excluded from measurements. Reported specimen data follows the format of the specimen label, with added notes in square brackets. Label information for primary types is quoted, with each line break indicated by “/” and each label separated by “//”. All specimens are brachypterous, unless otherwise indicated. In the specimens examined, males are abbreviated “m”, females “f” and “n” for nymphs. Abbreviations for US states follow official U.S. Postal Service state abbreviations. Scientific names are provided according to the nomenclature of the USDA “PLANTS” database (USDA: NRCS 2011).

Photographs of whole specimens and genitalia (Figs. 1–8) with associated measurements were taken using a Nikon SMZ-1500 Digital Imaging Workstation with Nikon DS-U1 digital Camera and NIS Elements Imaging software (version 3.0). Line drawings were made by Kimberley Shropshire (see Acknowledgements) by tracing photographs and rendering detail freehand with reference to specimens. Photographs of antennae (Fig. 10) were made using a 2000-era Philips [now FEI-USA] XL30 environmental scanning electron microscope (ESEM) capable of taking photographs without gold coating. Antennae of 3 species of *Aethodelphax* (*A. concavus* (Beamer), *A. megadontus* (Beamer), and *A. prairianus* sp. nov.) were compared (by KGAH) with 19 other Delphacini using ESEM photography (in addition to 92 representative genera of other Fulgoroidea) as follows: *Caenodelphax teapae* (Fowler), *C. nigroscutellata* (Beamer), *Delphacodes andromeda* (Van Duzee), *D. detecta* (Van Duzee), *D. magna* (Crawford), *D. plenatra* Beamer, *D. puella* (Van Duzee), *D. sagae* Beamer, *D. trimaculata* Beamer, *Elachodelphax* (*Elachodelphax*) *metcalfi* (Kusnezov), *E. (Aschedelphax) hochae* (Wilson), *E. (A.) paransera* (Beamer), *Koss-wigianella* (*Acanthodelphax*) *analisis* (Crawford), *Metadelphax propinqua* (Fieber), *Muirodelphax parvula* (Ball), *Paraliburnia kilmani* (Van Duzee), *Euides weedi* (Van Duzee), *Scolopygos pallida* Bartlett, and *Sogatella kolophon* (Kirkaldy).

## Taxonomy

### Genus *Aethodelphax* gen. nov.

**Type species.** *Aethodelphax prairianus* sp. nov., by present designation.

**Diagnosis.** The narrow, produced crown, pediform parameres with enlarged basal angles (most prominent in lateral aspect) and the aedeagal suspensorium with an elongate and sometimes reflexed dorsal connection to segment 10 will separate *Aethodelphax* from all other Delphacini.

**Description.** Pale, usually uniformly stramineous although darker markings may be present especially on thoracic pleuron and lateral portions of abdomen. Head slightly narrower than prothorax. Vertex slightly longer than wide, medially slightly produced; carinae of head evident, obscure at fastigium, concolorous to head. Frons subparallel, widest in ventral half; fork of median carina of frons approximately at fastigium. Antennae with pedicel twice as long as wide, weakly curved caudad, with close-set pustules bearing sensory spines, pustules forming a double row of 3 each on dorsal surface, one pustule on posterior surface, 1–2 smaller pustules on anterior surface (Figs. 10A–B), and a ring of 7 close-set pustules around tip of pedicel with the dorsal pustule much smaller than others (Fig. 10F); anterior rim of scape just below midline with a distinct campanuliform sensillum (Fig. 10C). Lateral carinae of the pronotum curved laterally behind eye, not reaching (or obscurely attaining) the hind margin. Most individuals brachypterous, tegmina apically rounded, shorter than abdomen leaving male pygofer and usually additional segments exposed in dorsal view. Macropters with wings clear, except some veins darkened near apex. Macropterous wing venation varied among individuals (particularly with respect to the number and arrangement of peripheral veins of the radius and anterior cubitus), but usually bearing 1 subcostal branch, 3 radial ( $R_1$ ,  $R_{2+3}$  and  $R_{4+5}$ ), 1 media, and 3 anterior cubitus branches ( $Cu_{1a}$ ,  $Cu_{1b}$ ,  $Cu_2$ ); nodal line in distal  $\frac{3}{4}$  of wing, outer subapical cell longer than inner subapical cell. Hind leg pectens (apical spinulation) 5 (3+2) (tibia), 7 (5+2) (basitarsus) 4 (2<sup>nd</sup> tarsomere); calcar flattened, ventrally concave, approximately  $\frac{2}{3}$  or more length of basitarsus, bearing 15+ fine black-tipped teeth on posterior margin, without distinct apical tooth.

Genitalia with parameres pediform, in lateral view basal angles well-developed and caudally projecting; in caudal view inner angle well developed, outer angle developed or rounded. Pygofer opening in caudal view just wider than long, with rounded to carinate margins; in lateral view rounded or with ventral portion somewhat projecting. Genital diaphragm well-developed, in most taxa narrowing medially with armature well-developed and dorsocaudally projecting (e.g., Figs. 9C–D; reduced in *A. caninus*, modified in *A. aetocephalus*). Aedeagus varied, but usually laterally flattened; straight, sinuate, or ventrally curved; often bearing large teeth or conspicuous foliations. Aedeagal suspensorium conspicuous, encircling aedeagus, approximately quadrate between aedeagus and segment 10. Segment 10 bearing a pair of short, widely separated processes from caudoventral corners, some species with second pair of teeth near ventral midpoint in lateral view.

**Remarks.** *Aethodelphax* superficially resembles several taxa of pale Delphacini such as *Elachodelphax*, *Muirodelphax* and pale species remaining in *Delphacodes*. *Elachodelphax* is generally a northern genus, Holarctic, with dark genae (and other markings). The opening of the male pygofer of *Elachodelphax* is distinctly carinate and wider than long, and the genital diaphragm medially keeled. The parameres of *Elachodelphax* lack the prominent basal angle of *Aethodelphax* and are usually short (exception *E. paransera*); the aedeagus of *Elachodelphax* usually has a pronounced enlargement in the basal portion and the processes of segment 10 are approximated, at least distally.

The antennae of *Aethodelphax* most closely resemble those of *Elachodelphax paransera* (transferred to *Elachodelphax* from *Delphacodes* by Hamilton & Kwon 2010), particularly in the reduction of the central pustule on the ring around the antennal tip, thus allowing the antennae to be raised to their fullest extent (Figs. 10B, C, F). These and other advanced Delphacini have a remarkable antennal structure apparently unique to Delphacidae: a campanuliform sensillum on the scape (Fig. 10C, inset) similar to, but much smaller than, that of Cercopidae (Liang & Fletcher 2002). Continuing research (by KGAH) suggests that this feature is widespread in the Delphacini but probably does not occur within genera with large numbers of scattered pustules.

*Muirodelphax* (*sensu* Hamilton & Kwon 2010) is also superficially similar, but males usually bear dark markings and the antennal pustules are smaller and farther apart. Parameres of *Muirodelphax* lack the pronounced basal angles of *Aethodelphax*, and the genital diaphragm is a simple dorsal thickening with a median keel. Also unlike *Aethodelphax*, segment 10 of male *Muirodelphax* lacks processes (or they are represented by teeth).

Aside from geography, *Delphacodes* s.s. differs from *Aethodelphax* most conspicuously in the former genus having a uniformly dark coloration (testaceous to brown), and the wings of the macropter of available specimens are weakly infuscated with a variably developed dark spot at the apex of the clavus. The lateral carinae of the pronotum clearly reach the hind margin in *Delphacodes* s.s., as it does in the Nearctic *Delphacodes plenatra* Beamer, and the genera *Megamelus* Fieber, *Delphacinus* Fieber, and *Megamelanus* Ball. The parameres are simple, forceps-like, and lacking the conspicuous basal and outer angles found in *Aethodelphax*. The genital diaphragm armature of most *Delphacodes* s.s. possesses a subdorsal, caudally projected, process (see Asche & Remane 1983, fig 9a; instead of dorsal and dorsocaudally directed), except *D. schinias* Asche & Remane 1983, and *D. framarib* Asche & Remane, 1983 that have a quadrate dorsal projection (see Asche & Remane 1983, figs. 15A, B); these taxa have a median tooth on the ventral opening of the pygofer, absent in *Aethodelphax*.

The species of *Aethodelphax* have so far been recorded from central and southeastern US states, except *A. caninus* from arid parts of Arizona and Mexico. The only species in this genus frequently encountered is the type species, known from 167 specimens. Among the seven previously described species, very few (only 30) specimens were observed beyond the 50 paratypes reported by Beamer in his original descriptions. The new species was obtained in native prairie habitats. The longest series (79 specimens) were taken by Ross sweeping, although they have also been taken by vacuum sampling. We feel it is probable that *Aethodelphax* is associated with grasses in prairie and longleaf-pine savannah habitats, although only two species have been reported from specified grasses: *Andropogon* in Illinois and *Muhlenbergia* in Mexico.

**Etymology.** *Aethes* (Greek, unusual, strange), with the genitive case-ending “-es” removed, combined with *Delphax* (referring to the type genus, derived from the Greek *delphax* [small pig]), with a combining connective ‘o’. We regard the genus name as masculine, consistent with ICZN’s (1961) statement regarding the gender of *Delphax*.

#### Key to species of *Aethodelphax* (males)

1. Segment 10 in lateral view with pair of short ventral processes (or large teeth) near midpoint in addition to distal paired processes (Figs. 3H, 7G, 8H) ..... 2
- 1’ Segment 10 in lateral view lacking a pair of ventral processes near midline (distal paired processes present) ..... 4
2. Aedeagus straight or slightly sinuate in lateral view with a lateral flange on one or both sides (Figs. 3F–H, 8F–H); outer angle of parameres acute or acuminate; segment 10 with midventral processes ventrally directed. .... 3
- 2’ Aedeagus curved ventrad in lateral view, large flange lacking (Figs. 7F–G); outer angle of parameres rounded; segment 10 with midventral processes lateroventrally directed; MS ..... *paraparvulus* (Beamer), **comb. nov.**
3. Aedeagus with subapical, dorsal tooth (Figs. 8F–H), lateral expansion of aedeagus without large acuminate tooth; apices of outer angles of parameres acute; FL, GA, LA ..... *sagittatus* (Beamer), **comb. nov.**
- 3’ Aedeagus without subapical, dorsal tooth (Figs. 3F–H), with large, acuminate flange on left side; apices of outer angles or parameres acuminate; FL ..... *alatus* (Beamer), **comb. nov.**
4. Aedeagus strongly curved ventrad (Figs. 2F–G); genital diaphragm bearing pair of subdorsal pegs, one on either side of aedeagus in repose; diaphragm armature not dorsally projecting; FL, LA, MS, TX ..... *aetocephalus* (Beamer), **comb. nov.**
- 4’ Aedeagus not strongly curved ventrad (aedeagus may be ventrally concave); genital diaphragm lacking subdorsal pegs, diaphragm armature dorsally projecting ..... 5
5. Segment 10 in lateral view robust with small ventral excavation at base of distal paired processes (Figs. 4G, 5G) ..... 6
- 5’ Segment 10 in lateral view dorsoventrally flattened, with broadly rounded excavation at base of distal paired processes (Figs. 1H, 6H) ..... 7
6. Aedeagus broadly flattened laterally bearing symmetrical teeth (Figs. 4F–G); genital diaphragm armature weakly projecting dorsally; AZ, Mexico ..... *caninus* (Beamer), **comb. nov.**
- 6’ Aedeagus tubular, not flattened laterally, lacking preapical ventral teeth; diaphragm armature dorsally projecting, taller than wide; FL, TN. .... *concavus* (Beamer), **comb. nov.**
7. Aedeagus with large dorsal concavity near midlength (Figs. 1F–H), subtended proximally by dorsal pectinate structure; aedeagal suspensorium strongly reflexed at midlength (Fig. 1H); Manitoba and MI to NE ..... *prairianus* **sp. nov.**
- 7’ Aedeagus lacking large dorsal concavity and pectinate (Figs. 6F–H); aedeagal suspensorium straight; KS, MN, WI ..... *megadontus* (Beamer), **comb. nov.**



*Aethodelphax prairianus* sp. nov.

(Fig. 1)

**Type locality.** Peoria Co., nr. Mossville, Illinois.

**Description. Color.** Males mostly stramineus; females entirely stramineus, sometimes with small dark spots on sides of pregenital tergites; males, when stramineus, darker on thoracic pleural regions, with orangish abdomen; usually brown overlaid with darker stripes on sides of pregenital tergites, pygofer paler except for dark brown parameres, diaphragm, and processes of segment 10; sometimes male abdomen tan with brown pleural regions, abdomen, and pygofer.

**Structure.** Length male brachypter (n=9)  $2.37 \pm 0.19$ , width (n=5)  $0.73 \pm 0.02$ , female brachypter (n=5)  $2.64 \pm 0.02$ , width  $0.74 \pm 0.02$ . Head just narrower than prothorax, ratio vertex L:W (n=10)  $1.05 \pm 0.06$ . Calcar bearing 18–24 small black teeth. Genitalia with pygofer opening as wide as long (Fig. 1D), lateral margins carinate; diaphragm well developed, armature conspicuous, wider than long, strongly projecting dorsocaudad. Parameres (Fig. 1E) pediform with outer angle short and acute, inner angle longer and; basal angle well developed, dorsocaudally projecting into sharp tapered projections. Aedeagus (Figs. 1F, G) laterally flattened, broadest basally, with strong concavity about midlength, narrowed to rounded apex beyond concavity; bearing 3 subapical ventral teeth, 2 large + 1 small dorsal teeth just dorsad of concavity, and 4 strong dorsal teeth proximad of concavity; gonopore subapical on ventral margin, just right of center. Aedeagal suspensorium strong, encircling aedeagus, sclerotized and straplike between aedeagus and segment 10, strongly recurved at midlength (Fig. 1H). Segment 10 elongate, bearing pair of short, acuminate processes on ventrocaudal margin, about as long as wide at base.

**Remarks.** The form of the aedeagus, with the strong median concavity (Fig. 1F), is unique among the species in the genus. The very strong dorsocaudally projecting diaphragm armature, and the sclerotized, straplike base of the suspensorium (Fig. 1H) are unusual features among the North American Delphacini.

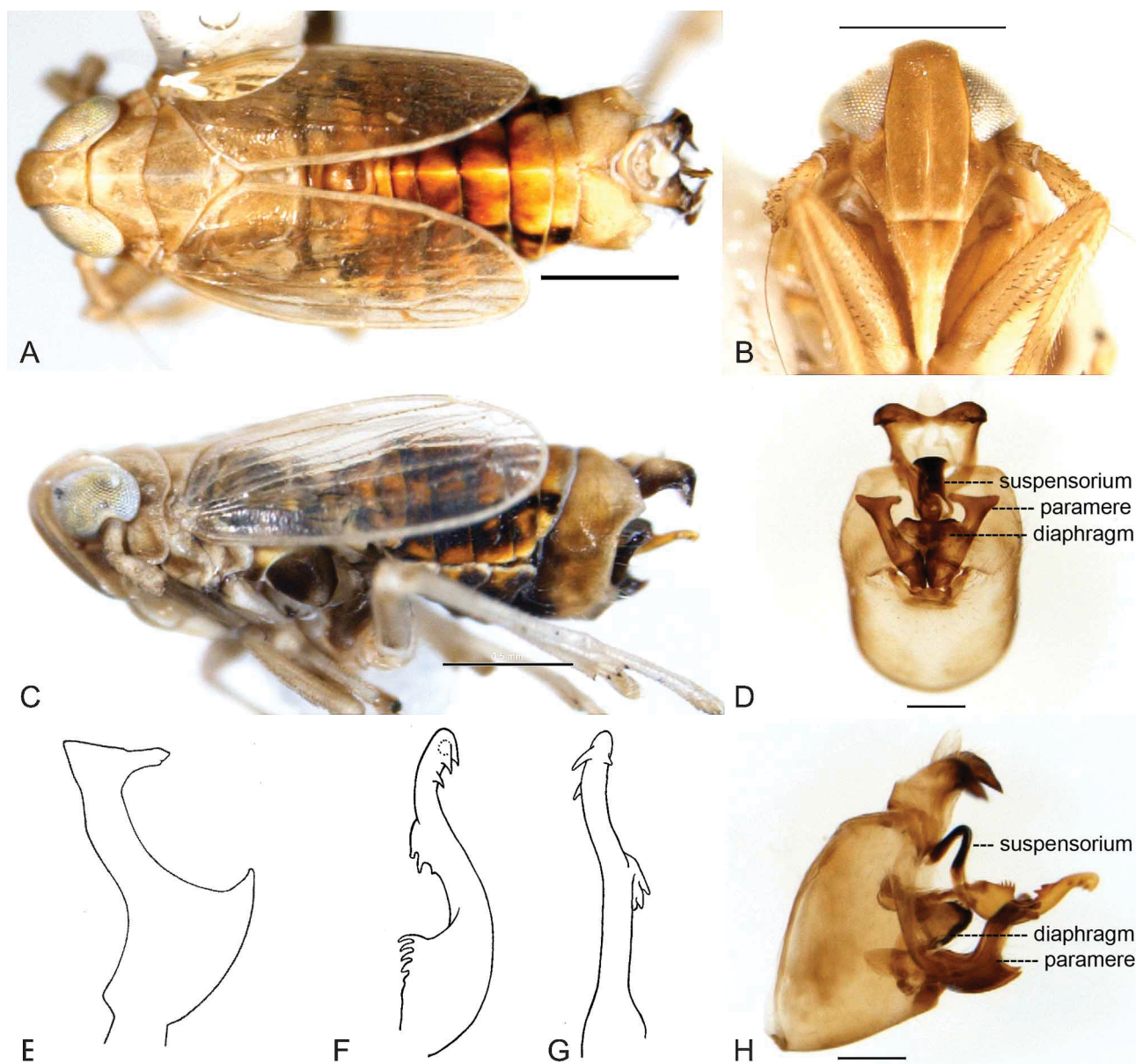
**Reported hosts.** The only lengthy series was collected by sweeping “*Andropogon* [in] NW corner” of an IL prairie remnant (HH Ross, field notes under GL 867). The 79 specimens were taken in association with five nymphs, one male and six females including one macropter of *Muirodelphax parvula*. A second shorter series (16 specimens) were swept from *Andropogon* in SD. Three individuals were vacuum sampled from Indian grass (*Sorghastrum nutans* (L.) Nash) in Wisconsin. All other specimens of *A. prairianus* have been swept or vacuum sampled from unspecified native prairie vegetation.

**Etymology.** The specific name is derived from ‘prairie’ (from French ‘*prairie*’ derived from Latin ‘*pratium*’ (=meadow) + ‘-aria’), truncated and combined an arbitrary suffix ‘-anus’ for euphony.

**Distribution.** Canada: Manitoba; USA: IL, MI, NE, SD, WI.

**Material observed. Holotype:** “USA ILLINOIS: Peoria / Co., 2.2km NW of / Mossville, N40.82027 / W89.59518; 30.vii.2007 / A. M. Wallner Vacuum” (1m, USNM). **Paratypes: Illinois:** same data as holotype (11m, 9f [3 macropters], UDCC; 2m, 2f, INHS); 2.2km NW of Mossville, Robinson Park south, 40.82027N, 89.59518W, 30 Jul 2007, A. M. Wallner, vacuum (2m, UDCC [part of type series although with different labels]); [Cass Co.] Chandlerville, 20–VII–[20]04, Hill Prairie, Sweep, N38°28’58”, W088°35’54” (1m, UDCC); [Marion Co., nr Kinmundy], 12 mile Prairie, 15–VIII–[20]04, Mesic Prairie, N38°47’53” W088°49’34”, vacuum (2m, UDCC).

**Other material observed: CANADA: Manitoba:** Winnipeg, 28 Aug. 1985, K.G.A. Hamilton (1m, CNCI); **USA: Illinois:** Champaign Co., Brownfield Woods, 1 Aug. 1959, Ross & Ross, GL 867 (54m, 25f [1 macropter], CNCI); Urbana, 9 Aug. 1959, J. Kingsolver, GL 381 (4m, 2f, CNCI); **Michigan:** Branch Co., Bronson, 7 Aug. 2004, K.G.A. Hamilton (1m, 2f, CNCI); **Nebraska:** Buffalo Co., Ruge Prairie T8N R14W Sec.8, 40°46’N 98°29’W, 5 June 2000, K. Nemec (1m, CNCI); Hall Co., Ruge Prairie T8N R11W Sec.1, 18 July 2000, K. Nemec (9m, 3f, CNCI); **South Dakota:** Roberts Co., Sica Hollow St. Pk., 17 km NW Sisseton, 17 June 1990, K.G.A. Hamilton, on bluestem (4m, 12f, CNCI); **Wisconsin:** Columbia Co., Redderman-Young Pr[airie] T11N R10E Sec.31 SW, 10 Aug. 1998, DNR study 053, D-Vac in Indian grass [on] dry-mesic hill prairie (1m, 2f, CNCI); Dane Co., Wright Oak Savannah T8N R7E Sec.1 SW4, 25 Aug. 1998, DNR study 053, sweep net in dry/dry-mesic prairie (1m [macropters], CNCI); Grant Co., Eagle Valley Preserve, Cottonwood Prairie T4N R6W Sec.27 W2, 12 Aug. 1998, DNR study 053, D-Vac in very large dry/dry-mesic bluff prairie (1m, CNCI); Lafayette Co., Argyle, 30 July 1997, K.G.A. Hamilton (2m, 3f, CNCI); Pepin Co., 7 km SSE Durand, 2 Aug. 1997, K.G.A. Hamilton (1m, CNCI); Sauk Co., Cassel Bluff Pres[erve] T9N R5E Sec.36 NW4, 11 Aug. 1998, DNR study 053, big/little bluestem, dropseed [in] dry-mesic prairie (2m macropters, CNCI).



**FIGURE 1.** *Aethodelphax prairianus* sp. nov. (paratype, Peoria co., IL., scale =0.5 mm (A–C), 0.2 mm (D, H)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus, left lateral view, distal apex at top; G. aedeagus, ventral view, apex at top; H. pygofer, lateral view.

***Aethodelphax aetocephalus* (Beamer, 1948), comb. nov.**

(Fig. 2)

*Delphacodes aetocephala* Beamer, 1948a: 97–98, 105.

**Type locality.** USA: Louisiana, St. Tammany Parish, Covington.

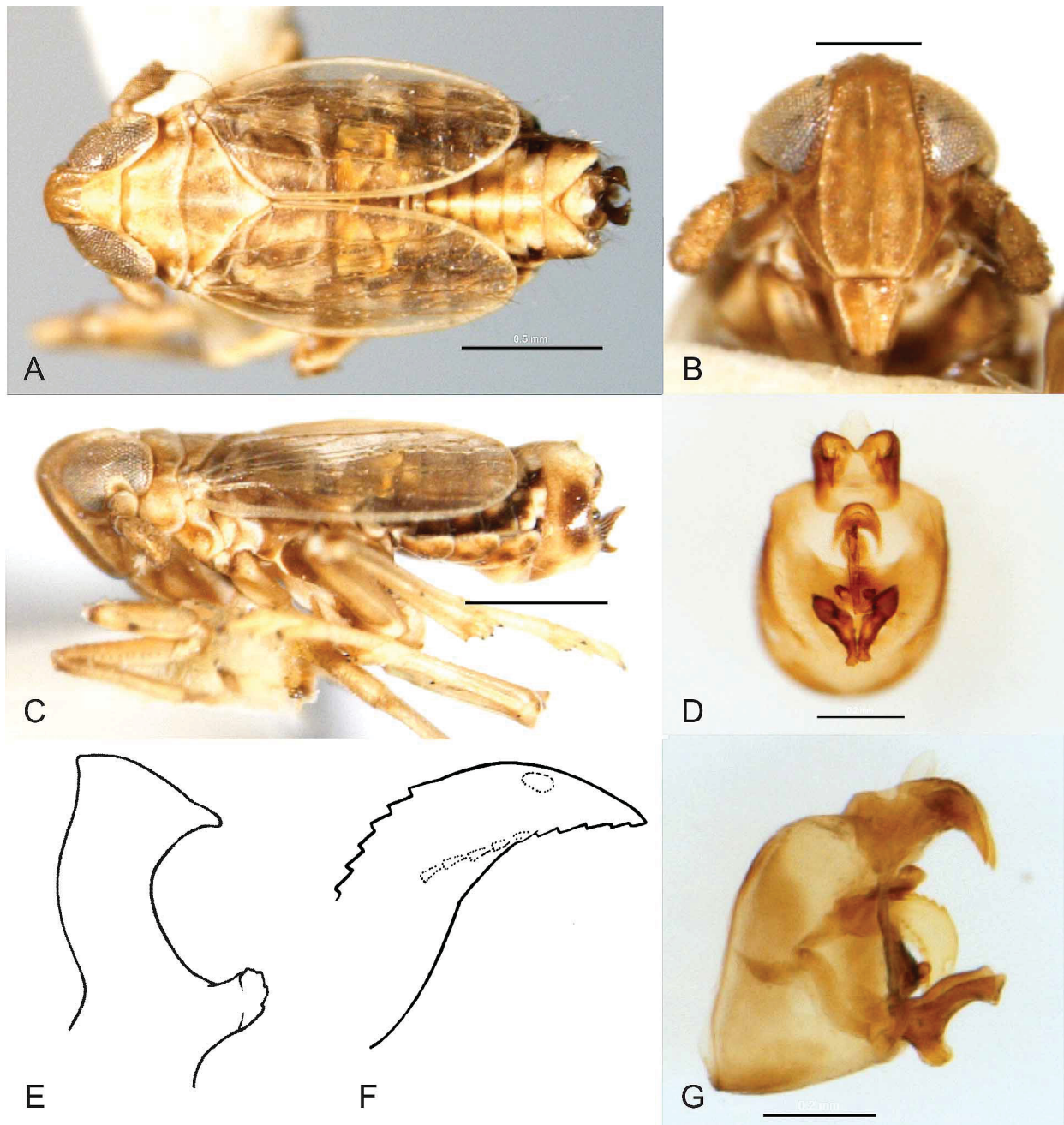
**Diagnosis. Color.** Body stramineus, darker on thoracic pleura, abdomen pale medially, darker laterally with variably developed longitudinal stria; male pygofer pale, diffusely darkened laterally; parameres, diaphragm, and processes of segment 10 darker.

**Structure.** Length male brachypter (n=6)  $1.96 \pm 0.11$ , width (n=5)  $0.70 \pm 0.03$ ; female brachypter (n=5) length  $2.30 \pm 0.10$ , width  $0.76 \pm 0.04$ . Head just narrower than prothorax, ratio vertex L:W (n=10)  $1.24 \pm 0.10$ . Calcar bearing 16–23 black teeth. Genitalia with pygofer opening taller than wide in caudal view (Fig. 2D), lateral margins defined by rounded carinae; diaphragm well developed, median ectal surface slightly projecting caudad; dorsal



margin concave, armature of the diaphragm weak along dorsal margin; however, subdorsally consisting of a series of ~6 short, darkened horizontal ridges subtending the aedeagus, and a pair of distinct darkened pegs embracing the aedeagus. Parameres (Fig. 2E) pediform with outer angle short and acute, inner angle longer and more acuminate, basal angle well developed, blunt, caudally projecting. Aedeagus (Fig. 2F) broad, strongly laterally flattened, strongly arched ventrally, distinctly narrowing apically, bearing a row of ~6 dorsal teeth beginning near midlength and a row of subventral teeth on both sides; gonopore subapical, dorsal. Aedeagal suspensorium conspicuous, encircling aedeagus, broad between aedeagus and segment 10. Segment 10 bearing pair of short, acuminate processes on ventrocaudal margin, about 2x as long as wide at base.

**Remarks.** All observed specimens were brachypterous. The broad, strongly curved aedeagus and form of the armature of the diaphragm is unique to this species in this genus. The structure of the genitalia is most similar to *paraparvulus*, but this species has a narrower aedeagus, a dorsocaudally projecting diaphragm armature, and segment 10 bearing a second pair of processes.



**FIGURE 2.** *Aethodelphax aetocephalus* (paratype Slidell, LA; scale =0.5 mm (A–C), 0.2 mm (D, G)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus; G. pygofer, lateral view.

**Reported hosts.** None.

**Distribution.** USA: FL, LA, MS, TX

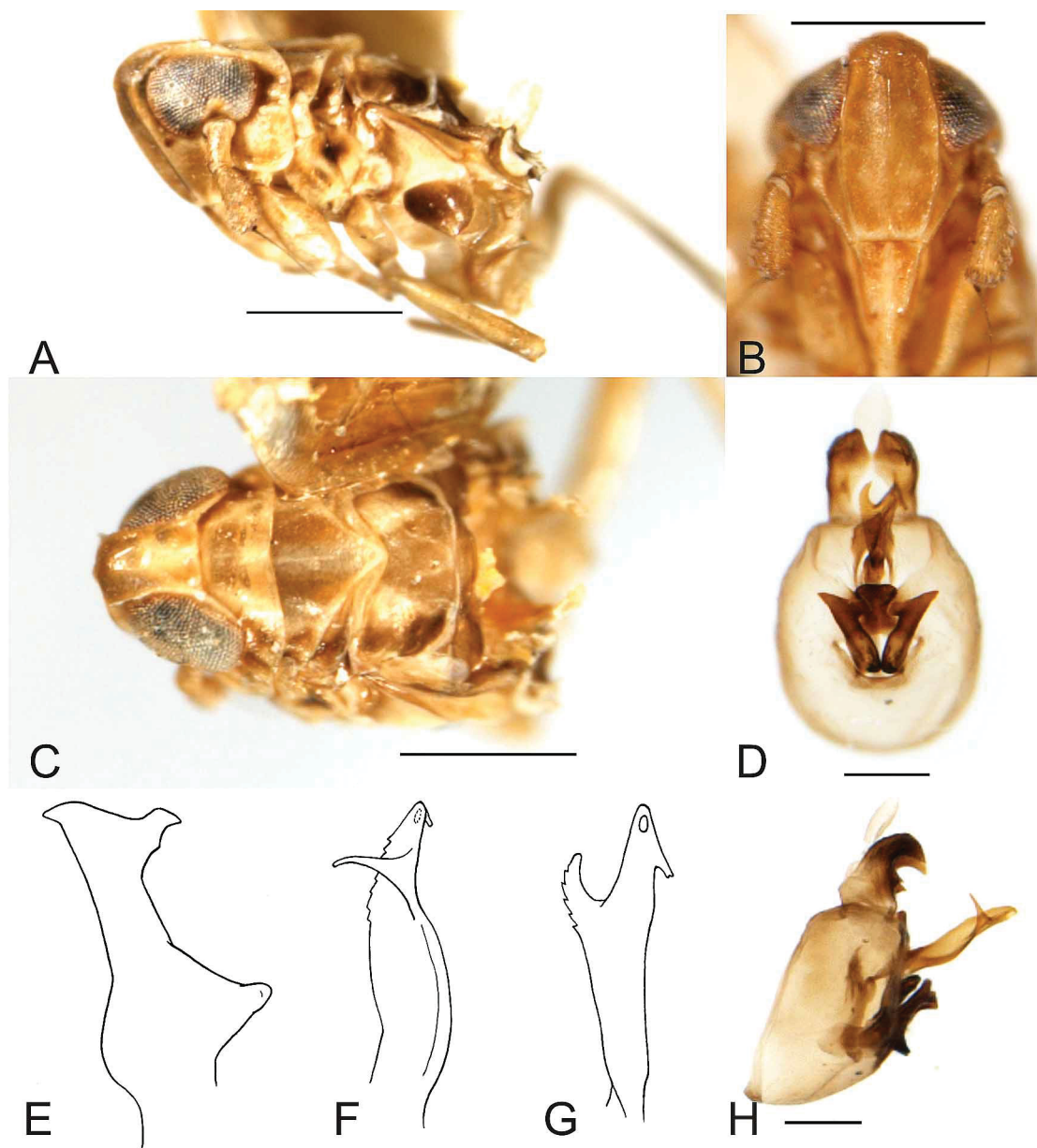
**Material observed.** PARATYPES: **USA: Louisiana:** [St. Tammany Parish] Slidell, 3–3–[19]47, R. H. Beamer (6m, 3f; SEMC); Covington, 3–3–[19]47, R. H. Beamer (1m, 4f; SEMC); **Mississippi:** [Harrison Co.] saucier, 3–5–1947, R. H. Beamer (1m, SEMC); [Jackson Co.], Ocean Springs, 3–3–1947, R. H. Beamer (2f, SEMC); same, 3–5–1947, L. D. Beamer [1m, SEMC]; **Florida:** [Jackson Co.] Marianna, 3–7–1947, R. H. Beamer (1m, SEMC).

**Other material observed:** USA: Texas: Wheeler Co., Shamrock, GL 1182, 1 September 1968, Cooley & Tucker (1m, CNCI).

*Aethodelphax alatus* (Beamer, 1948), comb. nov.

(Fig. 3)

*Delphacodes alata* Beamer, 1948b: 118–119.



**FIGURE 3.** *Aethodelphax alatus* (San Mateo, FL; scale =0.5 mm (A–C), 0.2 mm (D, H)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus, left lateral view, distal apex at top; G. aedeagus, ventral view, apex at top; H. pygofer, lateral view.



**Type locality.** USA: Florida, Monroe Co., Big Pine Key.

**Diagnosis. Color.** Body, stamineus, darker on pleural regions and lateral portions of body in dorsal view.

**Structure.** Length male brachypter 2 mm (Beamer 1948b; all observed specimens dissected), width (n=2) 0.50; female not observed. Head just narrower than prothorax, ratio vertex L:W (n=2) 1.04. Calcar bearing 19–20 fine black teeth. Genitalia with pygofer opening taller than wide in caudal view (Fig. 3D), lateral margins rounded; diaphragm well-developed, medially narrowed, armature of the diaphragm wider than tall, broadly rounded, strongly projecting dorsocaudally, lateral margins serrulate. Parameres (Fig. 3E) pediform with dorsal margin sinuate in caudal view, angled ventromedially; with distinct acuminate outer and inner angles; basal angle well developed, acute, caudally projecting. Aedeagus (Fig. 3F, G) laterally flattened, sinuate, curved slightly dorsad; bearing a conspicuous acuminate flange on left side, a large subapical tooth on right side, and a subapical dorsal row of small teeth; gonopore ventral subapical. Aedeagal suspensorium conspicuous, encircling aedeagus, about as wide as long between aedeagus and segment 10. Segment 10 longer than broad, bearing pair of short stout processes on ventrocaudal margin, and a second, much shorter pear about midlength in lateral view.

**Remarks.** This species was described from 6 specimens (4 males, 2 females). All observed specimens of this species had been previously dissected to confirm identification, and all were brachypterous. The presence of a second pair of processes on segment 10 separates this species from all others in the genus except *A. paraparvulus* and *A. sagittatus*. It can be separated from both these species by the acuminate flange on the aedeagus, and also by the absence of the large terminal dorsal aedeagal tooth of *sagittatus*, and by the aedeagus being somewhat sinuate instead of downcurved in *A. paraparvulus*. However, superficially, *A. alatus* appears most similar to *A. megadonatus*, which lacks the second pair of processes on segment 10 and has more extensive aedeagal foliations.

**Reported hosts.** None.

**Distribution.** USA: FL.

**Material observed.** PARATYPES: USA: Florida [Collier Co.] Naples, 3–16–1947, R. H. Beamer (1m, SEMC).

**Other material observed:** USA: Florida [Putnam Co.] San Mateo, 12–23–1950, L.D. & R.H. Beamer (1m, SEMC).

*Aethodelphax caninus* (Beamer, 1947), **comb. nov.**  
(Fig. 4)

*Delphacodes canina* Beamer, 1947: 60, 69.

**Type locality.** USA: Arizona, Santa Rita Mountains.

**Diagnosis. Color.** Stramineus with diffuse darker markings on lateral portions of abdomen; parameres, processes on segment 10 darker. Macropter with lateral compartments of mesonotum darker.

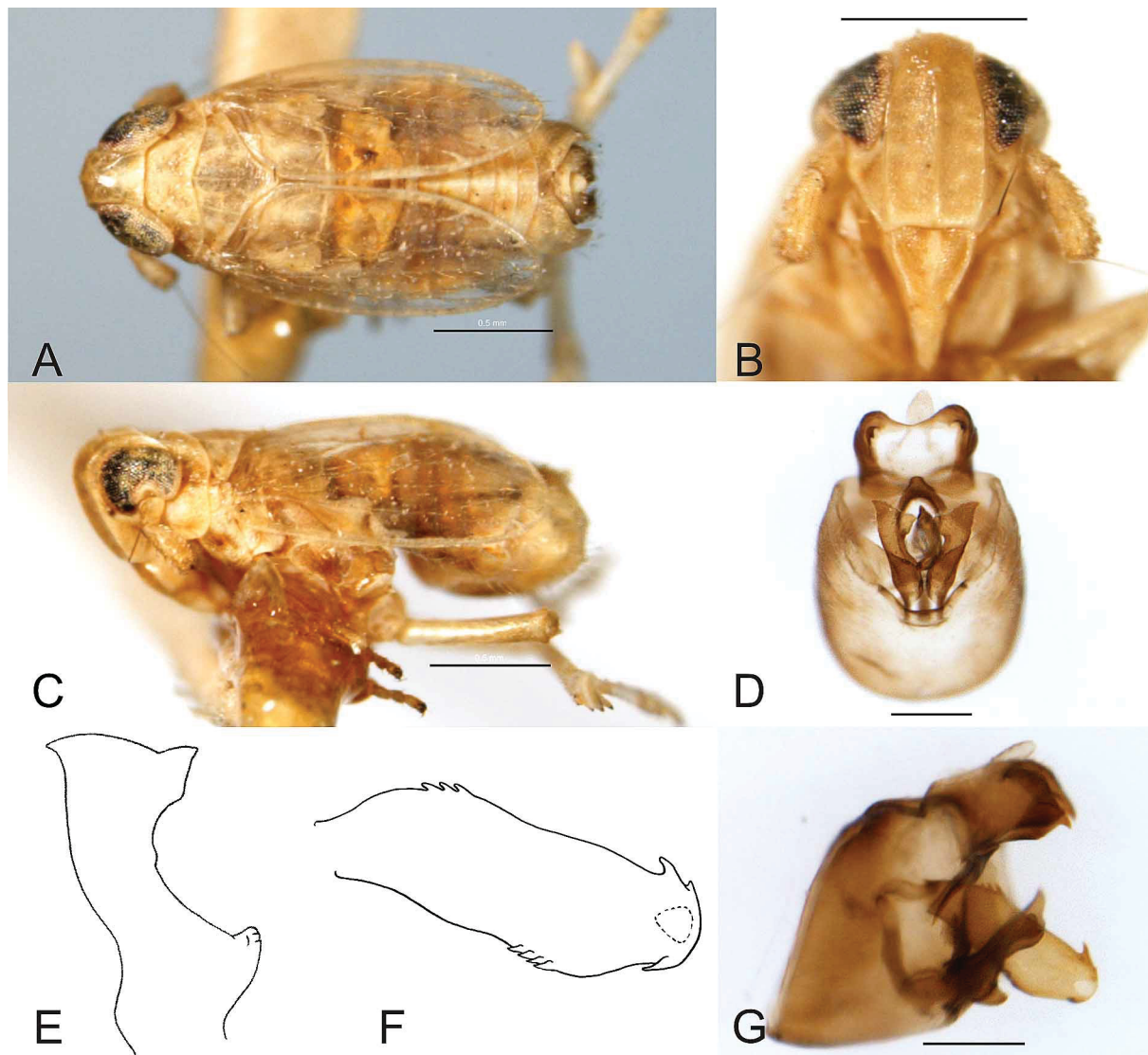
**Structure.** Length male brachypter (n=1) 2.21, width 0.76; female brachypter (n=1) 2.30, width 0.78. Head just narrower than prothorax, ratio vertex L:W (n=2) 1.27. Calcar bearing 13–18 black teeth, becoming smaller distally. Genitalia with pygofer opening taller than wide in caudal view (Fig. 4D), lateral margins with rounded carinae; diaphragm developed, medially concave, relatively narrow, armature of the diaphragm weak slightly projecting caudally along dorsal margin. Parameres (Fig. 4E) pediform with distinct acuminate outer and inner angles, dorsum of parameres slightly sinuate, angled ventromedially from caudal view; basal angle well developed, blunt, caudally projecting. Aedeagus (Fig. 4F) straight, broad, strongly laterally flattened, narrowed to broadly rounded apex; left side slightly concave; bearing large subapical dorsal tooth, a large subapical ventral tooth, a row of ~5 ventral teeth just beyond midlength, and a row of ~4 dorsal teeth in proximal third; gonopore subapical on left side. Aedeagal suspensorium conspicuous, encircling aedeagus, short between aedeagus and segment 10. Segment 10 relatively large and broad, bearing pair of very short processes on ventrocaudal margin, about as long as wide at base.

**Remarks.** One of the observed specimens from the type locality was a macropter with the forewings missing. On this specimen, the lateral portions of the mesonotum were slightly darkened (suggesting a median vitta) than the brachypterous specimens. This is the only southwestern species of *Aethodelphax*. The broadly flattened aedeagus and reduced diaphragm armature are unique to this species among *Aethodelphax*. This species may be most similar to *A. sagittatus*, but the broad aedeagus lacking the lateral foliations of *A. sagittatus*, and the broad segment 10 lacking a second pair of processes, separate *A. caninus* from *A. sagittatus*.

**Reported hosts.** *Muhlenbergia* sp.

**Distribution.** USA: AZ; Mexico (Chihuahua State).

**Material observed.** USA: **Arizona:** [Pima Co.,?], St Rita Mts [Santa Rita Mountains], 8–7–[19]35, E. D. Ball (1m, macropter, 1f, USNM); same, 8–8–[19]35 (1m, USNM). **MEXICO: Chihuahua:** Guacochie Rd, 39mi W. Baeza, 2700m, 30.x.1995; C. H. Dietrich, 95–977, *Muhlenbergia* (1m, 1f, 2 nymphs, INHS).



**FIGURE 4.** *Aethodelphax caninus* (Santa Rita Mtns., AZ; scale =0.5 mm (A–C), 0.2 mm (D, G)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus; G. pygofer, lateral view.

***Aethodelphax concavus* (Beamer, 1948), comb. nov.**

(Fig. 5)

*Delphacodes concava* Beamer, 1948b: 113, 117.

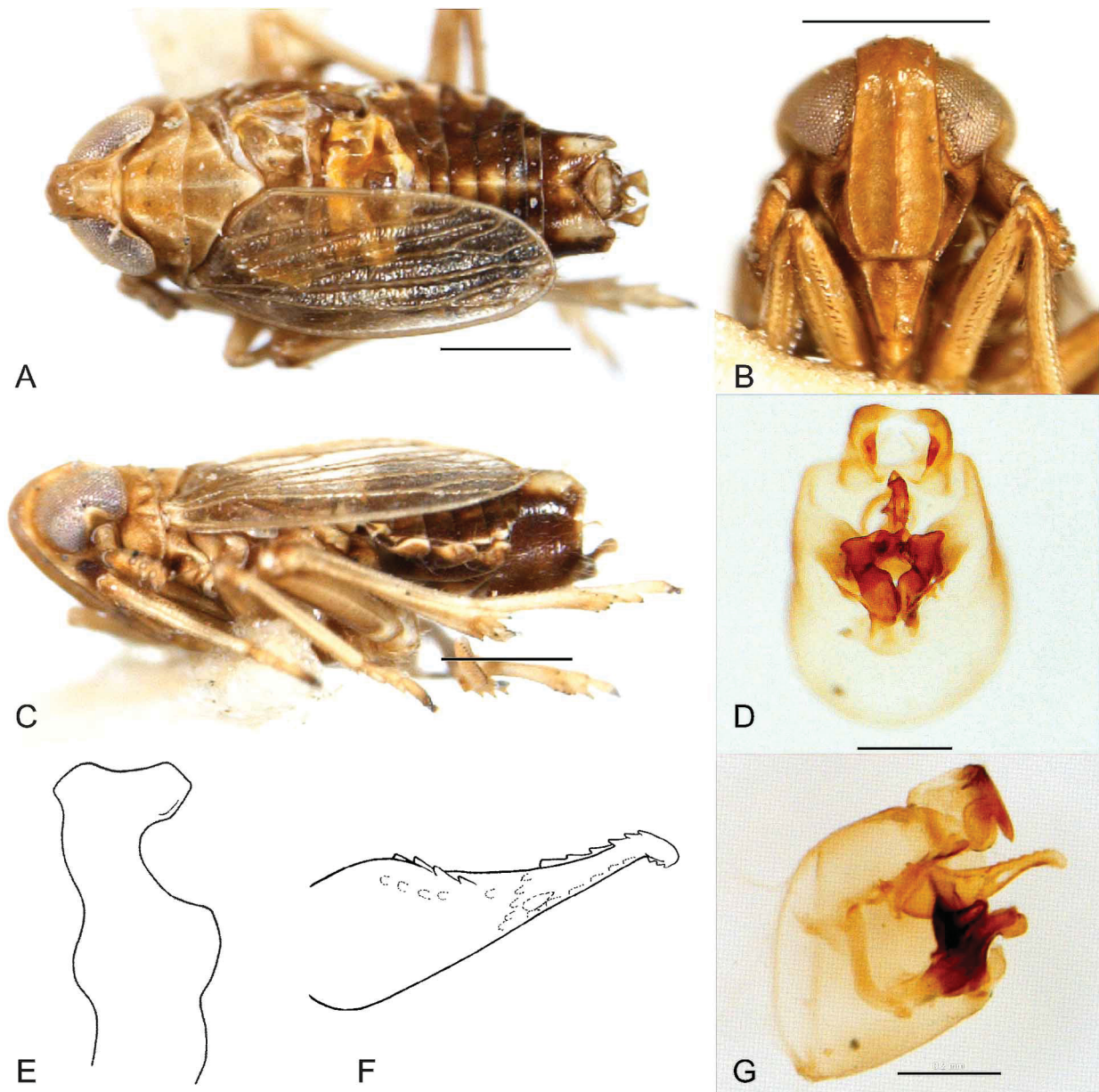
**Type locality.** USA: Florida, Leon Co., Woodville.

**Diagnosis. Color.** Body tan, darker on pleural regions and broadly darker on abdomen; pygofer pale, diffusely darker laterally; parameres and processes of segment 10 dark brown.

**Structure.** Length male brachypter (n=1) 1.98, width 0.60; female not observed. Head just narrower than prothorax, ratio vertex L:W (n=1) 1.40. Calcar bearing (n=3) 17–20 black teeth. Genitalia with pygofer opening about as wide as tall (Fig. 5D), lateral margins carinate; diaphragm well developed, medially narrowed, armature of the

diaphragm well-developed, dorsocaudally projecting, in caudal view about as tall as wide, broadening dorsally to cordate apex. Parameres (Fig. 5E) pediform, outer angle short and rounded, inner angle elongate, blunt, dorsum of parameres slightly sinuate, angled dorsomedially from caudal view; basal angle slightly projecting. Aedeagus (Fig. 5F) broad near base, bent upward near base, narrowing and slightly curved distally to rounded ventrally curved apex (providing a concave appearance to the aedeagus venter from lateral view); apical third of aedeagus with a fine ventral row of teeth and a fine dorsal row of teeth that continue diagonally across the right of shaft, and a sub-dorsal row beginning in apical third of shaft; gonopore in apical third, on right side. Aedeagal suspensorium, encircling aedeagus, narrow between aedeagus and segment 10. Segment 10 broad in lateral view, bearing pair of short straight ventrally directed processes on ventrocaudal margin, about 1.5x as long as wide at base.

**Remarks.** The single pair of straight processes on segment 10, and the tapering, ventrally concave aedeagus separates this species from all others in the genus. The most similar species might be *A. paraparvulus*, which differs most obviously by having a second pair of processes on segment 10. All observed specimens were brachypterous.



**FIGURE 5.** *Aethodelphax concavus* (paratype Sanford, FL; scale = 0.5 mm (A–C), 0.2 mm (D, G)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus; G. pygofer, lateral view.



**Reported hosts.** None.

**Distribution.** USA: FL, TN.

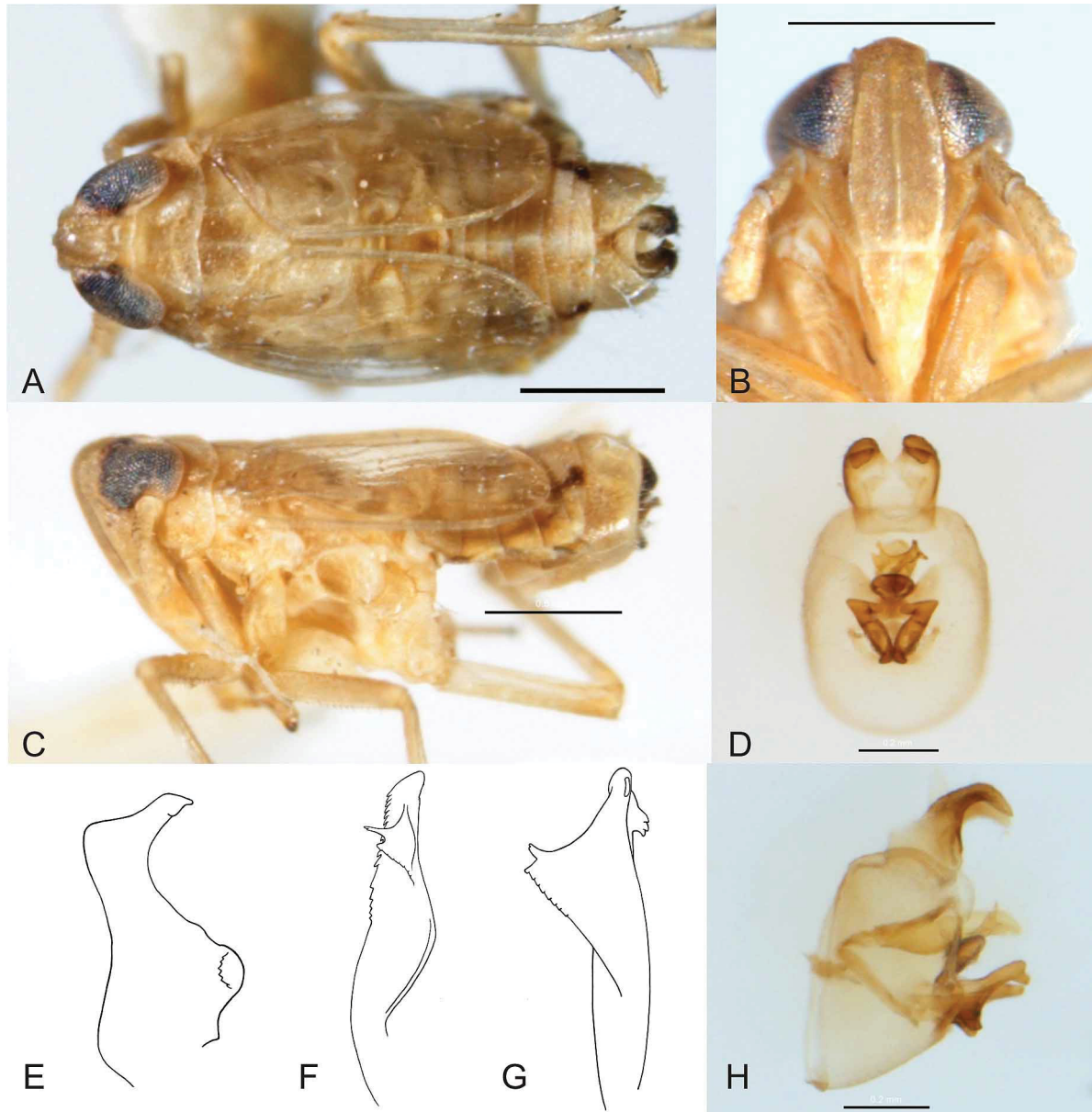
**Material observed.** PARATYPES: **USA: Florida:** [Seminole Co.] Sanford, 10–7–[19]’25, E. D. Ball (1m, USNM), same, 7–22–[19]26 (1m, USNM); [Leon Co.]; Woodville, 3–7–1947 (1m, 1f, AMNH).

**Other material observed:** **USA: Florida:** Long Pine Key, Everglades N.P., 24 Dec. 1951, GL 334, Rich & Stannard (2m, CNCI); **Tennessee** [Wayne Co.] Waynesboro, 8–4–1948, H. W. Crowder (1m, SEMC).

***Aethodelphax megadontus* (Beamer, 1951), comb. nov.**

(Figs. 6, 9A)

*Delphacodes megadonta* Beamer, 1951: 11–12, 14.



**FIGURE 6.** *Aethodelphax megadontus* (paratype Meade Co., KS; scale =0.5 mm (A–C), 0.2 mm (D, H)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus, left lateral view, distal apex at top; G. aedeagus, ventral view, apex at top; H. pygofer, lateral view.

**Type locality.** USA: Kansas, Meade County.

**Diagnosis. Color.** Stramineus, some specimens with longitudinal stria on lateral portions of abdomen; pygofer pale, parameres and processes of segment 10 darker.

**Structure.** Length male brachypter (n=5)  $2.09 \pm 0.10$ , width  $0.70 \pm 0.02$ ; female brachypter (n=5)  $2.49 \pm 0.14$ , width  $0.77 \pm 0.05$ . Head just narrower than prothorax, ratio vertex L:W (n=10)  $1.13 \pm 0.10$ . Calcar bearing (n=5) 19–20 fine black teeth. Genitalia with pygofer opening about as wide as tall (Fig. 6D), lateral margins bearing rounded carinae; diaphragm well developed (Fig. 9A), narrowing medially, armature of diaphragm large, dorsocaudally projecting, in caudal view about as tall as wide, expanding dorsally to broadly rounded apex. Parameres (Fig. 6E) pediform, outer angle short and acute, inner angle more elongate, acute; dorsum of parameres slightly sinuate, angled ventromedially from caudal view; basal angle distinctly projecting to blunt apices. Aedeagus (Figs. 6F, G) rather broad, approximately parallel sided, narrowed to rounded apex; apical half aedeagus with a very large flange on ventral left side, terminating in pair of large acuminate teeth; dorsum with fine dorsal row of teeth in apical half, large subapical tooth on right side of shaft, and short, subapical row of fine teeth on venter; gonopore subapical on venter. Aedeagal suspensorium encircling aedeagus, broad between aedeagus and segment 10. Segment 10 narrow and elongate in lateral view, bearing pair of short, curved, blunt processes on ventrocaudal margin, about as long as wide at base.

**Remarks.** This species is most easily separated from its congeners by having a single pair of processes on segment 10 and a very large foliation on the left side of the aedeagus bearing a pair of large teeth. Specimens from MN and WI appear to have a more flattened aedeagal shaft with a narrower process, as in *A. alatus*, but there is insufficient material available to determine whether this represents geographical or normal variation. *Aethodelphax megadontus* is distinguished from *A. alatus* by 2 pairs of processes on segment 10. All observed specimens were brachypterous.

**Reported hosts.** None.

**Distribution.** USA: KS, MN.

**Material observed.** PARATYPES: USA: **Kansas:** Meade Co., 9-6-1949, R. H. Beamer (3m, 2f, SEMC); same, 5-2-1948 (5m, 7f, SEMC).

**Other material observed:** USA: **Minnesota:** [Washington Co.], 5 km N Pt. Douglas, 12 Aug. 1993, K.G.A. Hamilton (1m, CNCI); **Wisconsin:** [Iowa Co.], 3 km SW Arena, 29 July 1997, K.G.A. Hamilton (1m, CNCI).

***Aethodelphax paraparvulus* (Beamer, 1948), comb. nov.**

(Figs. 7, 9B, E)

*Delphacodes paraparvula* Beamer, 1948b: 112–113, 117.

**Type locality.** USA: Mississippi, Hancock Co., Pearlinton.

**Diagnosis. Color.** Body uniformly yellowish-stramineus, parameres and processes on segment 10 darker.

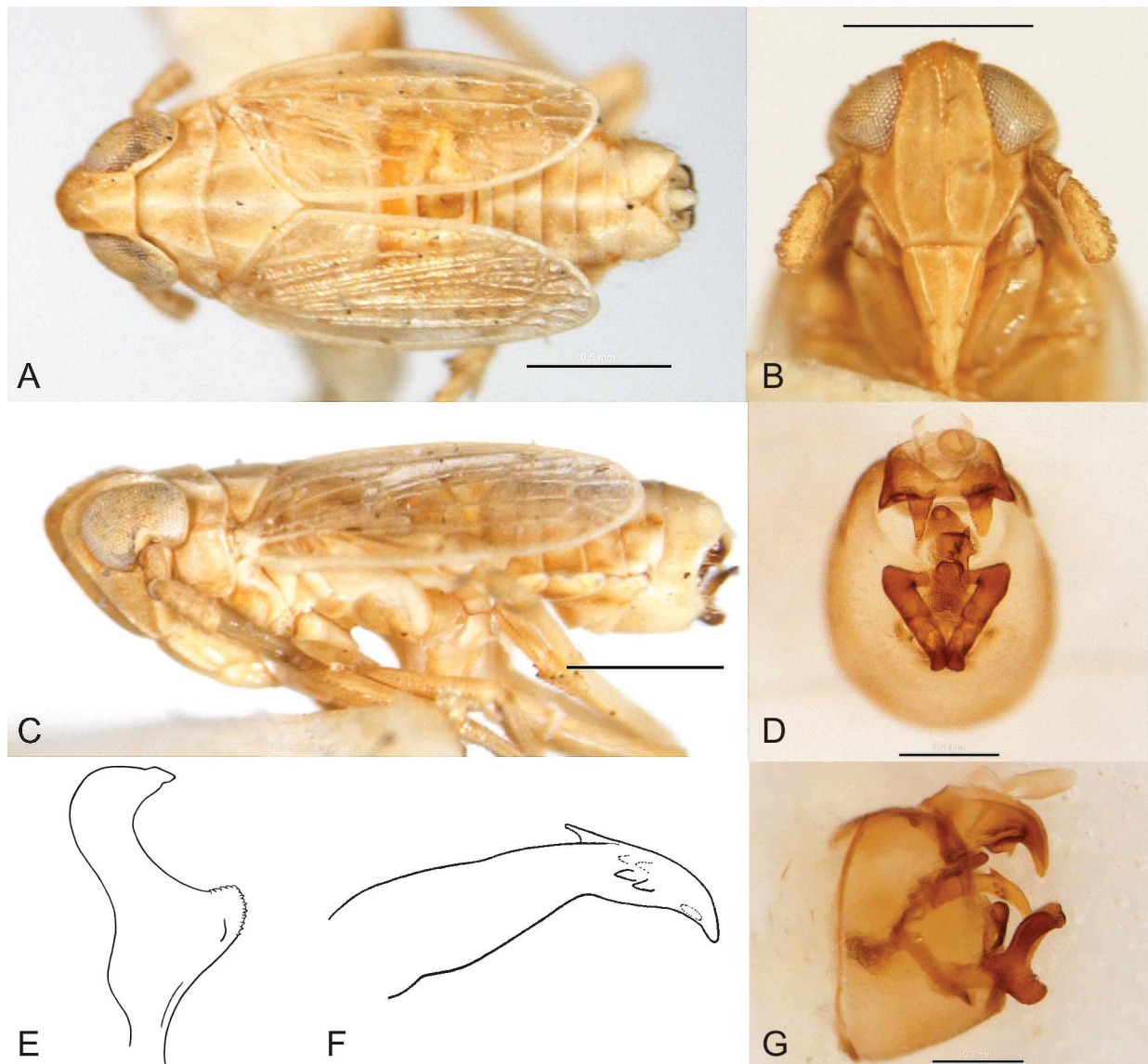
**Structure.** Length male brachypter (n=2)  $2.07 \pm 0.07$ , width  $0.70 \pm 0.04$ ; female brachypter (n=1) length 2.60, width 0.82. Head just narrower than prothorax, ratio vertex L:W (n=3)  $1.14 \pm 0.09$ . Calcar bearing 18–25 black teeth (n=2). Genitalia with pygofer opening taller than wide in caudal view (Fig. 7D), lateral margins of opening rounded; diaphragm well developed (Fig. 9B), median ectal surface projecting caudad; dorsal margin concave, dorsal armature of the diaphragm distinct, quadangular, taller than wide. Parameres (Fig. 7E) pediform, outer angle rounded, inner angle elongate, terminally acute, basal angle well developed, blunt, caudally projecting. Aedeagus (Fig. 7F) laterally flattened, arched ventrad, narrowing apically, bearing ~8 large, irregularly placed teeth in apical third; gonopore subapical, ventral. Aedeagal suspensorium distinct, encircling aedeagus, quite weak ventrally. Segment 10 bearing pair of short, acuminate processes on ventrocaudal margin, about 2x as long as wide at base, plus second pair of short processes, wider than long, ventrolaterally situated approximately at midlength of segment 10 in lateral view.

**Remarks.** All observed specimens were brachypterous. This species is most similar to *A. aetocephalus*, except *A. paraparvulus* has a second set of processes on segment 10 and the aedeagus is less broad, with relatively few, irregularly distributed teeth. Of the species of *Aethodelphax*, only *A. paraparvulus* and *A. aetocephalus* have a strongly ventrally curved aedeagus.

**Reported hosts.** None.

**Distribution.** USA: MS.

**Material observed.** PARATYPES: USA: Mississippi [Hancock Co.] Pearlinton, 3–3–[1947], R. H. Beamer (3m, 1f, SEMC).



**FIGURE 7.** *Aethodelphax paraparvulus* (paratype Pearlinton, MS; scale =0.5 mm (A–C), 0.2 mm (D, G)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus; G. pygofer, lateral view.

***Aethodelphax sagittatus* (Beamer, 1947), comb. nov.**

(Figs. 8, 9C, D)

*Delphacodes sagittata* Beamer 1947: 64, 71.

**Type locality.** USA: Georgia, Okefenokee swamp.

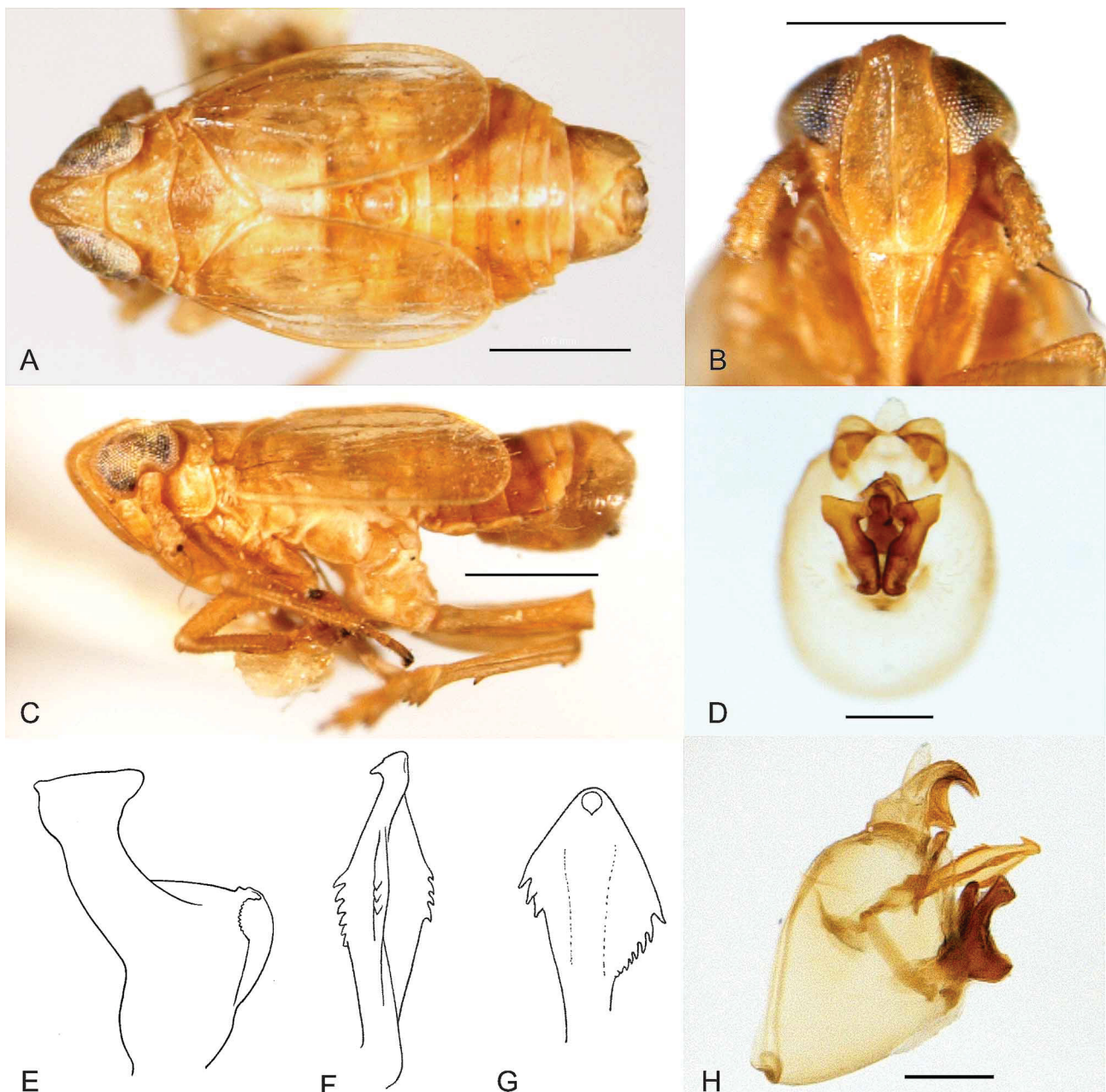
**Diagnosis. Color.** Uniformly stramineus, including male pygofer; parameres, diaphragm, and processes of segment 10 darker.

**Structure.** Length male brachypter (n=5)  $2.20 \pm 0.08$ , width  $0.69 \pm 0.03$ ; female brachypter (n=5) length  $2.35 \pm 0.29$ , width  $0.70 \pm 0.34$ . Head just narrower than prothorax, ratio vertex L:W (n=10)  $1.31 \pm 0.17$ . Calcar bearing (n=5) 19–26 fine black-tipped teeth. Genitalia with pygofer opening about as tall as wide in caudal view (Fig. 8D), lateral margins of opening carinate; diaphragm well developed (Figs. 9C, D), narrowing medially, dorsal armature

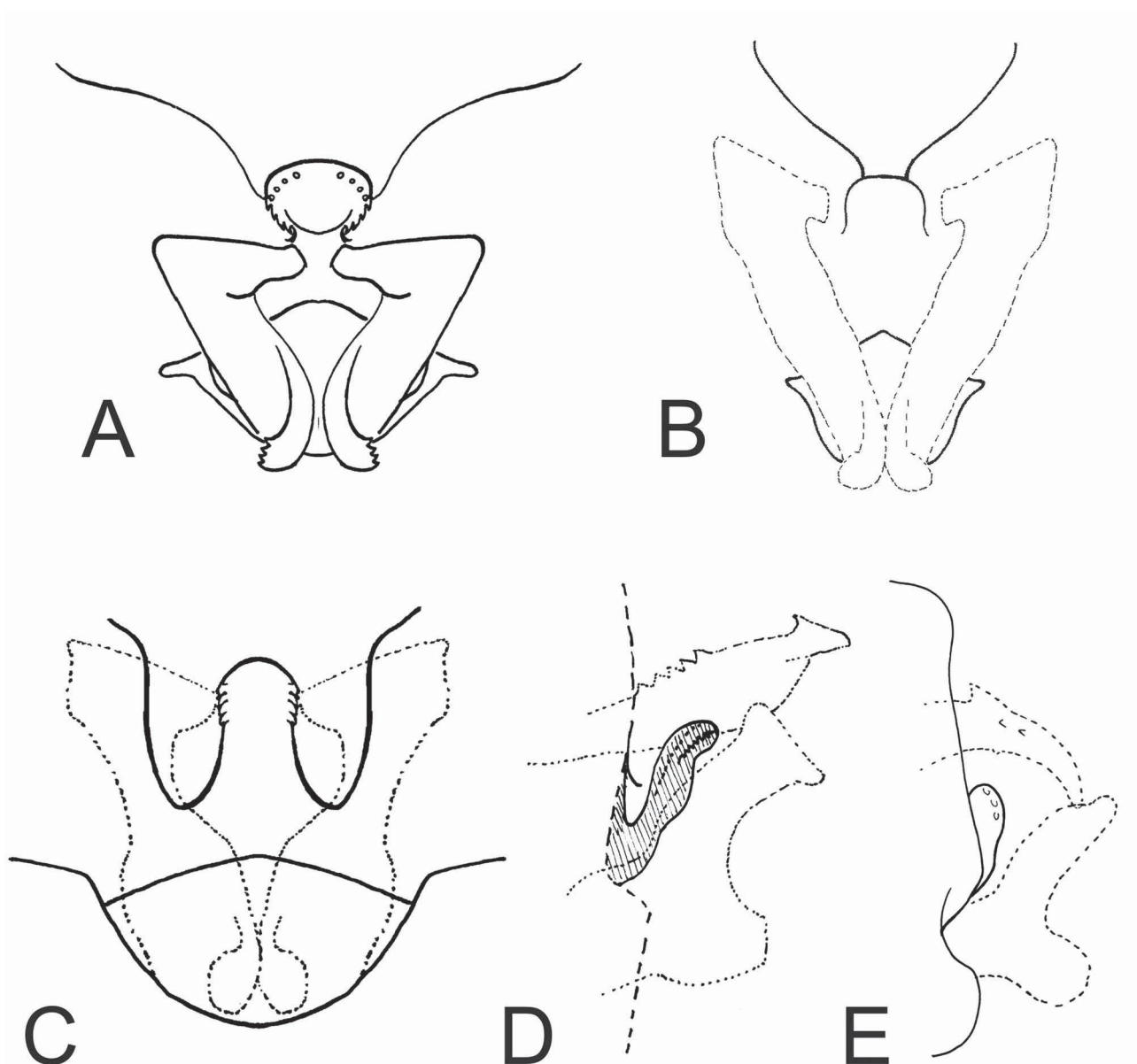


of the diaphragm strongly produced dorsocaudally, taller than wide, rounded apically. Parameres pediform (Fig. 8E), dorsal margin in caudal view weakly sinuate, angled slightly ventromedially; outer angle broad and acute, inner angle more elongate, acute, basal angle strongly produced caudally, blunt. Aedeagus (Fig. 8F) laterally flattened, straight, dorsal apex with large tooth, subapical ventral margin bearing serrate flange on both left and right side, low dorsal serrate flange beginning near midlength extending distally; gonopore subapical, ventral. Aedeagal suspensorium distinct, encircling aedeagus, portion between aedeagus and segment 10 as wide as long in caudal view. Segment 10 elongate in lateral view, bearing pair of short, pointed processes on ventrocaudal margin, just longer than wide at base, plus second pair of processes of nearly the same size at midlength of ventral margin of segment 10 in lateral view.

**Remarks.** *Aethodelphax sagittatus* can be most readily recognized by the pair of processes on segment 10 and the aedeagus bearing foliations and a large subapical dorsal tooth. The second pair of processes on segment 10 is shared with *A. paraparvulus* and *A. alatus*, but neither of these species have the large subapical dorsal aedeagal tooth. All observed specimens were brachypterous.



**FIGURE 8.** *Aethodelphax sagittatus* (Ramsay, LA; scale = 0.5 mm (A–C), 0.2 mm (D, H)). A. dorsal view; B. frons; C. lateral view; D. pygofer, caudal view; E. left paramere, widest view; F. aedeagus, left lateral view, apex at top; G. apex of aedeagus, ventral view; H. pygofer, lateral view.



**FIGURE 9.** Genital diaphragm armature. A. *Aethodelphax megadontus*, caudal view; B. *A. paraparvulus*, caudal view; C. *A. sagittatus*, caudal view; D. *A. sagittatus*, lateral view (genital diaphragm hatched); E. *A. paraparvulus*, lateral view.

**Reported hosts.** None.

**Distribution.** USA: FL, GA, LA.

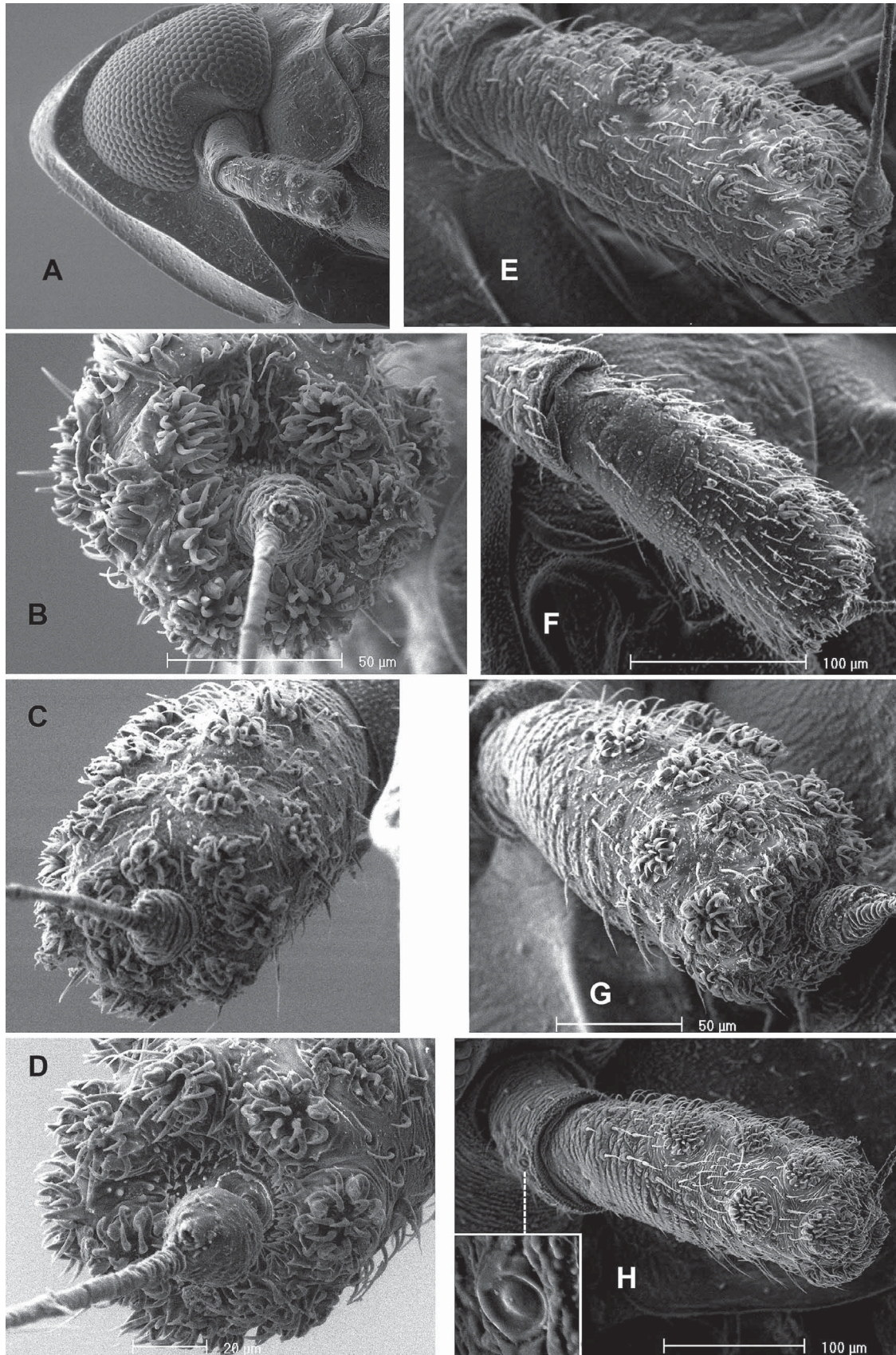
**Material observed.** PARATYPES: **USA: Georgia:** [Charlton Co.] Okefenokee swamp, B[illy's].I[sland]., 7–27–[19]39, R. H. Beamer (1f, SEMC); Okefenokee swamp, 7–25–[19]39, R. H. Beamer (3f [1 macropter], SEMC); **Florida** [Hendry Co.] La Belle, 7–16–[19]39, P. B. Lawson (1f, SEMC).

**Other material observed:** **USA: Louisiana:** [St. Tammany Parish] Ramsay, 3–3–1947, R. H. Beamer (10m, 5f, SEMC); **Florida:** [Seminole Co.] Sanford, 7–28–1948 (1m, SEMC).

## Discussion

*Aethodelphax* is comprised of one new species and seven species originally described in *Delphacodes* by R. H. Beamer. The species described by Beamer are seldom encountered, and several of them are still known only from the type series. The apparent rarity of these species probably results from them being highly specialized grass-feeders that, like *A. prairianus*, are associated with native grasslands (prairies and savannahs). The high incidence of





**FIGURE 10.** Scans of antennal characters. A. lateral aspect of head and prothorax of *Aethodelphax concavus*; B. tip of antenna of *Aethodelphax prairianus*; C. same, of *Caenodelphax teapae*; D. same, of *Elachodelphax paransera*; E. anterior surface of pedicel of *Aethodelphax megadontus*; F. same, of *Muirodelphax parvula*; G. same, of *Caenodelphax teapae*; H. same, of *Elachodelphax paransera*, with inset showing enlargement of campaniform sensillum on scape.



brachyptery suggests host and habitat fidelity, and it seems likely that these species are found near the base of their host, which would make suction sampling the most effective collection method, or, as suggested by Beamer (1946: 128), by "... cutting the bunches [of grass] with a knife and either taking the insects directly from the stubble or shaking them into a net from the cut portion...". Field observations with respect to these assertions would be greatly desirable.

The description of a new genus and species brings the current count of delphacid taxa north of Mexico to 56 genera and 337 species. The removal of 7 species from *Delphacodes* leaves 108 New World species in the genus, 72 of which are reported North of Mexico, and all of which are probably misplaced at the generic level. Further investigation of the higher Delphacini, with particular regard to *Delphacodes* is greatly needed to resolve the systematics of this taxon to develop taxonomy tractable to the non-specialist.

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